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Students First !

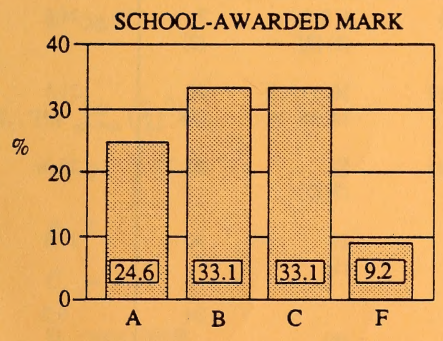
Student Evaluation and Records

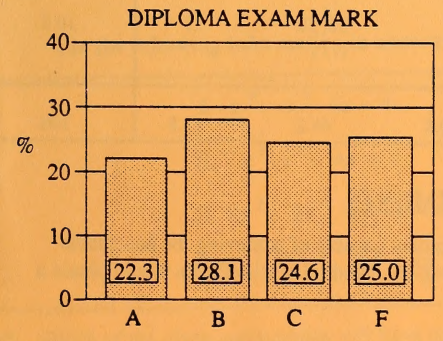
EXAMINER'S REPORT
JANUARY
1990

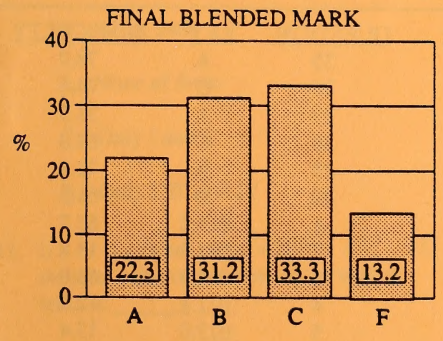
CANADIANA

APR 25 1990

Mathematics 30 Diploma Examination Results







The summary information in this report is intended to provide teachers, school administrators, students, and interested others with an overview of results from the January 1990 administration of the Mathematics 30 Diploma Examination. The information will be most useful when teachers and administrators use it in conjunction with the detailed school and jurisdiction reports that have been mailed to school jurisdiction offices. An annual provincial report containing a detailed analysis of the combined January and June results will be distributed in the fall of 1990.

DESCRIPTION OF THE EXAM

The Mathematics 30 Diploma Examination consists of three parts: a multiple-choice section of 40 questions worth 61.5% of the total, a numerical-response section of 12 questions worth 18.5% of the total, and a written-response section of three questions worth 20% of the total.

ACHIEVEMENT OF STANDARDS

The information reported is based on the final blended marks achieved by 8 932 students who wrote the January 1990 Mathematics 30 Diploma Examination.

- 86.8% of these students achieved the acceptable standard (a final blended mark of 50% or higher)
- 22.3% of these students achieved the standard of excellence (a final blended mark of 80% or higher).

PROVINCIAL AVERAGES

- The average school-awarded mark was 67.7%.
- The average diploma exam mark was 63.4%.
- The average final blended mark, representing an equal weighting of the diploma and school marks, was 66.0%.

Alberta EDUCATION

SUBTEST RESULTS

When analysing any detailed examination results, please bear in mind that subtest averages **cannot** be directly compared.

Machine-scored questions: 64.9%

Written-response: 56.9%

- Course Content
  - Trigonometry: 65.8%
  - Quadratic Relations: 61.1%
  - Sequences, Series, Limits: 58.5%
  - Statistics: 70.2%
  - Logarithms: 69.4%
  - Polynomial Functions: 57.1%

- Cognitive Levels
  - Knowledge: 68.3%
  - Comprehension: 75.3%
  - Application: 61.1%
  - Higher Mental Activities: 40.7%

EXAMINATION BLUEPRINT

Each question on the examination is classified in two ways: according to the cognitive level demanded by the question and according to the curricular content area being tested. The examination blueprint illustrates the distribution of questions according to these classifications. Numbers in round brackets ( ) indicate numerical-response questions, numbers in square brackets [ ] indicate written-response questions, and those without brackets are multiple-choice questions.

Reporting Category	Questions by Cognitive Level				Examination Emphasis (%)
	Knowledge	Comprehension	Application	Higher Mental Activities	
Trigonometry	3	2, 4, 5, 6	1, 8, 9 (1) [2]	7 (2)	24.6
Quadratic Relations	12	17, 18, 19 (3) (4)	10, 11, 13, 14, 15, 16	20 (5)	21.5
Sequences, Series, Limits	25	21, 24, 26 (6)	22 (7) [3]	23, 27	20.0
Statistics	28	31 (8)	29 [1]	30	13.8
Logarithms	32	33, 35 (10)	(9)	34	9.2
Polynomial Functions	38	40 (12)	36, 39 (11)	37	10.8
Examination Emphasis (%)	9.2	30.8	46.2	13.8	100

RESULTS and EXAMINER'S COMMENTS

The examination has a balance of question types and difficulties designed so that a student capable of achieving the acceptable standard would obtain a mark of 50% or better on the examination. Students achieving the standard of excellence would obtain a mark of 80% or better on the examination.

MULTIPLE CHOICE and NUMERICAL RESPONSE

QUESTION	KEY	DIFFICULTY*	QUESTION	KEY	DIFFICULTY	QUESTION	KEY	DIFFICULTY
1	C	78.5	18	A	77.9	35	A	78.0
2	B	91.7	19	D	79.0	36	C	74.4
3	B	61.3	20	C	52.0	37	A	33.5
4	D	66.6	21	B	82.2	38	C	63.0
5	B	80.9	22	C	70.6	39	B	71.3
6	C	84.4	23	A	50.6	40	D	61.5
7	A	57.6	24	D	85.7	1	015.2	85.7
8	D	72.8	25	A	54.6	2	003.0	18.8
9	C	74.0	26	D	75.9	3	007.2	63.9
10	D	71.9	27	A	51.0	4	011.4	72.1
11	C	60.5	28	D	71.9	5	023.0	15.4
12	A	84.2	29	D	69.5	6	121.5	57.7
13	B	67.3	30	B	45.4	7	252.0	51.2
14	B	41.3	31	A	79.7	8	008.1	82.4
15	B	46.3	32	C	73.9	9	001.6	71.5
16	C	59.7	33	B	83.2	10	000.5	67.6
17	A	60.5	34	D	40.9	11	001.5	25.3
						12	350.0	70.0

* Percentage of students answering the question correctly

MULTIPLE CHOICE and NUMERICAL RESPONSE (continued)

1. In ΔABC, $\angle B = 118^\circ$, $b = 32.6$ cm, and $a = 16.3$ cm. The measure of $\angle C$ correct to the nearest tenth of a degree is

   A. 63.8°

   B. 54.2°

   *C. 35.8°

   D. 26.2°

Question 1 required students to determine the measure of an angle using the Sine Law and was answered correctly by 78.5% of the students. Students who stopped part way through the solution would select $\angle A = 26.2^\circ$, alternative D. Alternative D attracted 25.7% of the students, while only 6.5% of those achieving the standard of excellence chose this response.

25. The $\lim_{n \to \infty} \left(\frac{2}{3}\right)^n$ is

   *A. 0

   B. 1

   C. ∞

   D. nonexistent

Question 25 was answered correctly by only 54.6% of the students. An understanding of limits such as the one in this question is necessary for the students to enable them to understand the development of the formula for the sum of an infinite geometric series, which follows in the course objectives. In general, evaluating limits continues to be a problem for many students.

Use the following information to answer question 37.

I. $x^3 + x^2 - 4x - 4$

II. $-x^3 - x^2 + 4x + 4$

II. $2x^3 + 2x^2 - 8x - 8$

IV. $3x^3 + 3x^2 - 12x - 12$

37. Which of the given polynomials will have the same zeros?

   *A. All of them

   B. None of them

   C. Only I and II

   D. Only I, III and IV

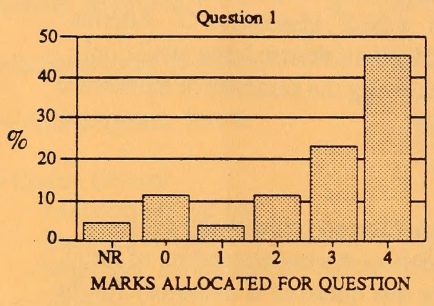
Question 37 was found to be difficult, with 33.5% of the students answering correctly. The majority of students do not seem to know that multiplying a polynomial by a constant will not change its zeros or the x-intercepts of the corresponding polynomial function. Most of these students, 27.5%, chose D, thinking they could change the polynomial by a constant provided this did not change the signs. Even those students achieving excellence answered this question poorly, with only 54.9% of them answering correctly.

11. If $x - c$ is a factor of $6x^3 + 3cx^2 - c^2x - 27$, then the value of c correct to the nearest tenth is _____.

The numerical-response questions discriminate very well between students achieving at the acceptable and excellent standards. Question 11 was answered correctly by 25.3% of the students. Of those students achieving the standard of excellence, 64.9% answered correctly. Of the remaining students who achieved the acceptable standard on the examination overall, 18.7% answered correctly and only 4.4% of those not achieving the acceptable standard were able to answer correctly.

WRITTEN RESPONSE

The three written-response questions were designed so that most students would have some success with question 1 and that questions 2 and 3 would be challenging to even the excellent students.

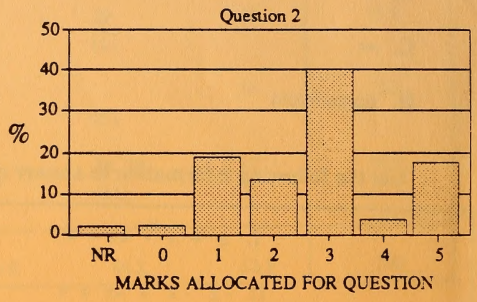


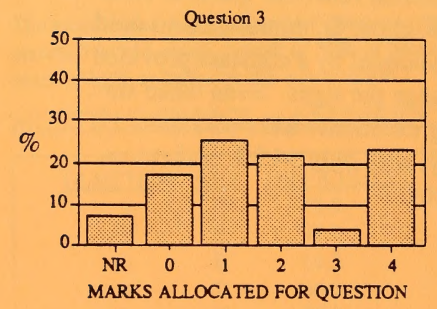
Question 1 was done well by most students. Some students did not appear to know that there is a difference between positive and negative z-scores. The markers were concerned that many students continue to equate z-scores with areas and to use equal signs incorrectly. For example:

$$z = 0.75 = 0.2734 = 0.2734 + 0.5 = 0.7734(5000) = 3867$$

On this 4-mark question, the average mark was 2.80 for 70.0% of the available mark.

Question 2 results indicate that most students were able to draw a diagram and then to find the minimum distance between the vehicles. To find the maximum distance between the car and the truck, many students incorrectly added the distances along the roads. Only 23% of the students were able to identify the second situation involving an angle of 131° and hence obtained more than 3 marks for their solution. On this 5-mark question, the average mark was 2.78 for 55.6% of the available mark.





Question 3 was difficult for most students. Two marks could be obtained for determining that there were 60 deposits with an effective interest rate of 0.75% per period. Only 28.1% of the students were able to go beyond this point in the question. The most common error was failing to recognize the annuity and attempting to do the question as the accumulated amount of a lump sum using the formula $A=P(1+i)^n$. On this 4-mark question, the average mark was 1.78 for 44.5% of the available mark.

Some students continue to omit pertinent explanations, calculations, or formulas. Such solutions do not receive full credit. In question 1, for example, if a student showed only the two correct answers, a mark of 2 would be assigned. Similarly, for question 3, if a student showed only the correct accumulated amount, the mark assigned would be only 1 out of a possible 4 marks.

For further information, contact Phill Campbell or Bob Dearborn at Student Evaluation and Records Branch, 427-2948.